Impact of management measures, fish prices and stock abundance in the fleet dynamics of the otter-trawlers operating in Galician-Cantabrian Sea fishing ground

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The Spanish Otter–Trawl fleet

- mixed fishery
- carries out two métiers[1]:
- ✓demersal métier targeting demersal species
- ✓pelagic métier targeting mixed pelagic and demersal species
- complex management: quotas for most of species; from 2014 Individual Vessel Quotas (IVQ)
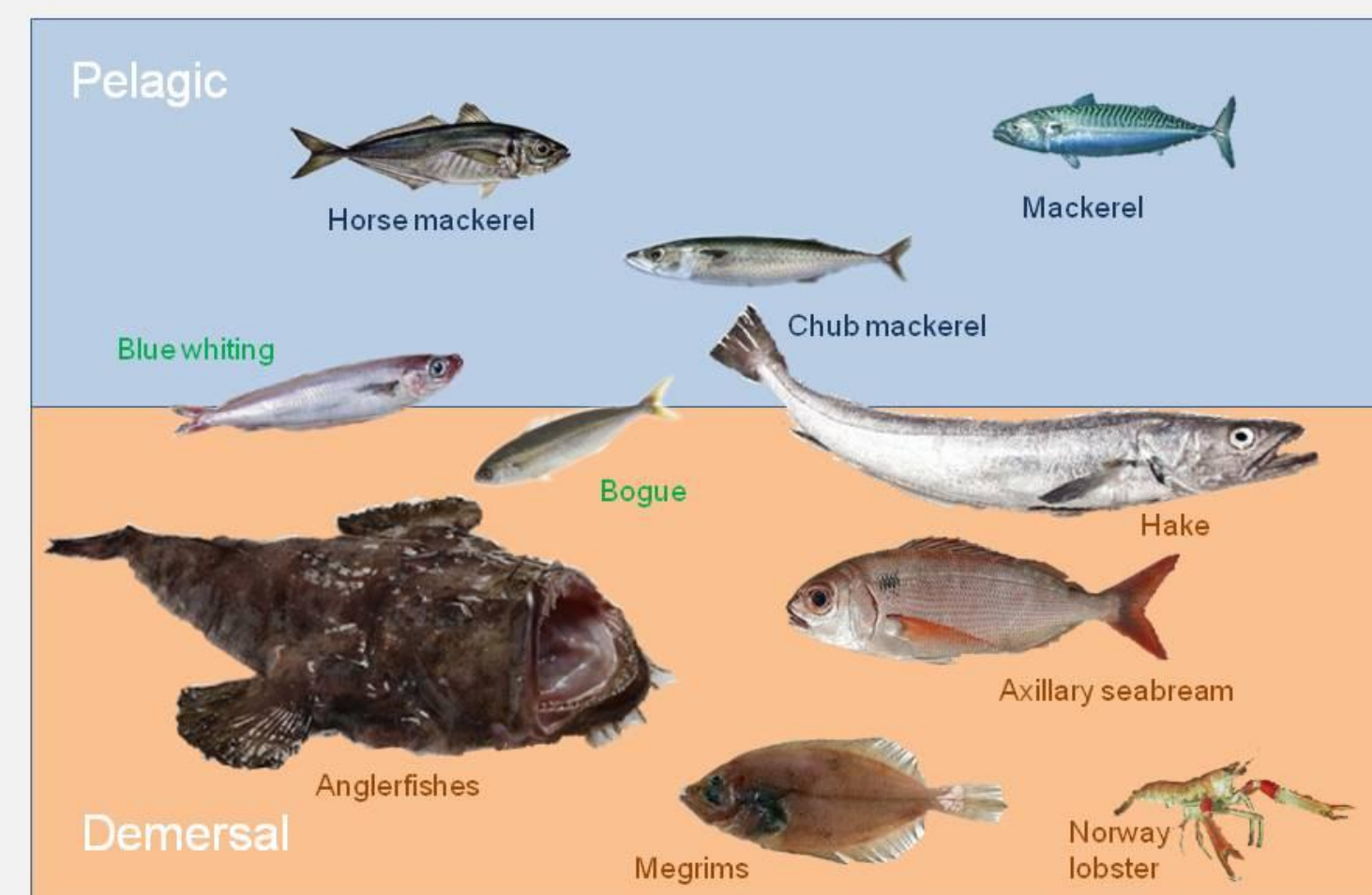
Objectives

- identify economic and biological drivers of the métier selection
- impact of management measures in métier choice

Data

- sales notes
- Galician-Cantabrian Sea (ICES VIIIc+IXaN)
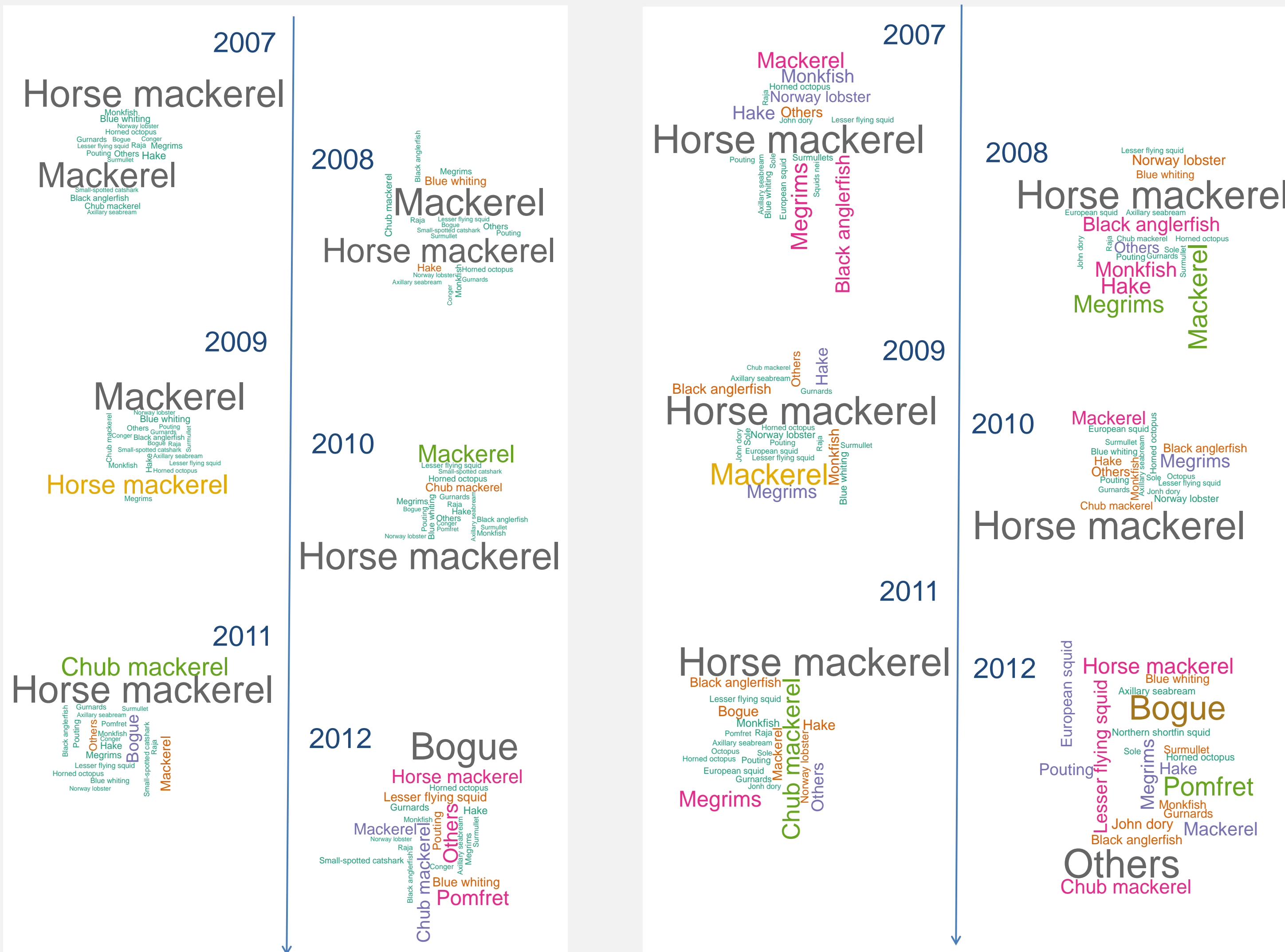- years 2007 to 2012

Methods

- statistical description of trips characteristics
- Random Utility Models[4,5]: binomial logit model with trip as unit

Relative importance of species in annual landings

Volume

2007 Horse mackerel
2008 Mackerel / Horse mackerel
2009 Mackerel / Horse mackerel
2010 Mackerel / Horse mackerel
2011 Chub mackerel / Horse mackerel
2012 Bogue

Value

2007 Horse mackerel
2008 Horse mackerel
2009 Horse mackerel
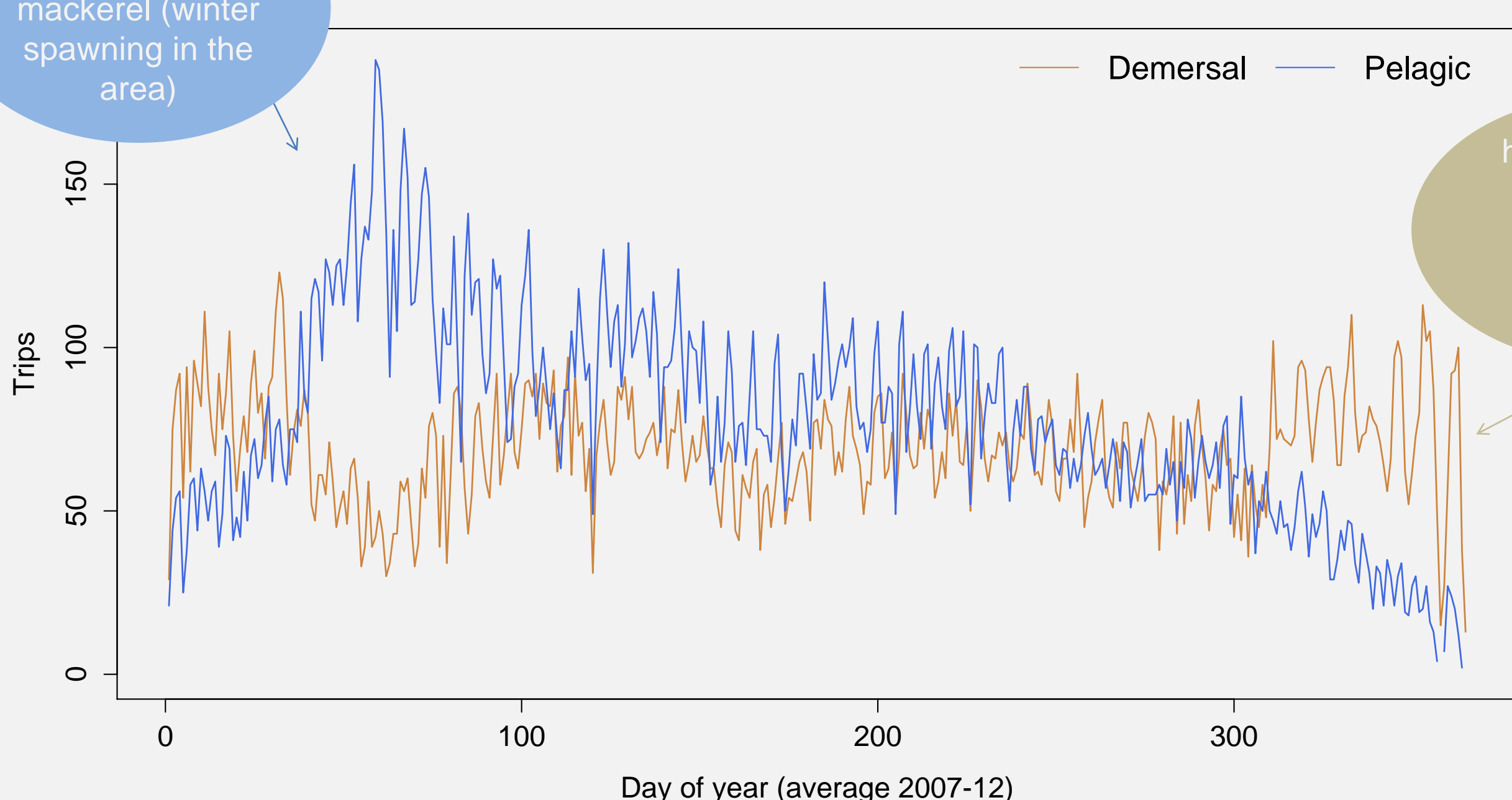2010 Horse mackerel
2011 Horse mackerel
2012 Others

2007-2010: mackerel & horse mackerel: 73% weight / 41% value

hake, megrims, anglerfishes & norway lobster: 10% weight / 40% value

2011-2012: drastic changes in species composition, maybe due to incorrect species identifications

Seasonality of métiers

seasonal abundance mackerel (winter spawning in the area)

higher demand and prices for demersal species in ChristX

Demersal — Pelagic

Trips / Day of year (average 2007-12)

Model framework

Intermediate and final variables during 2007-10

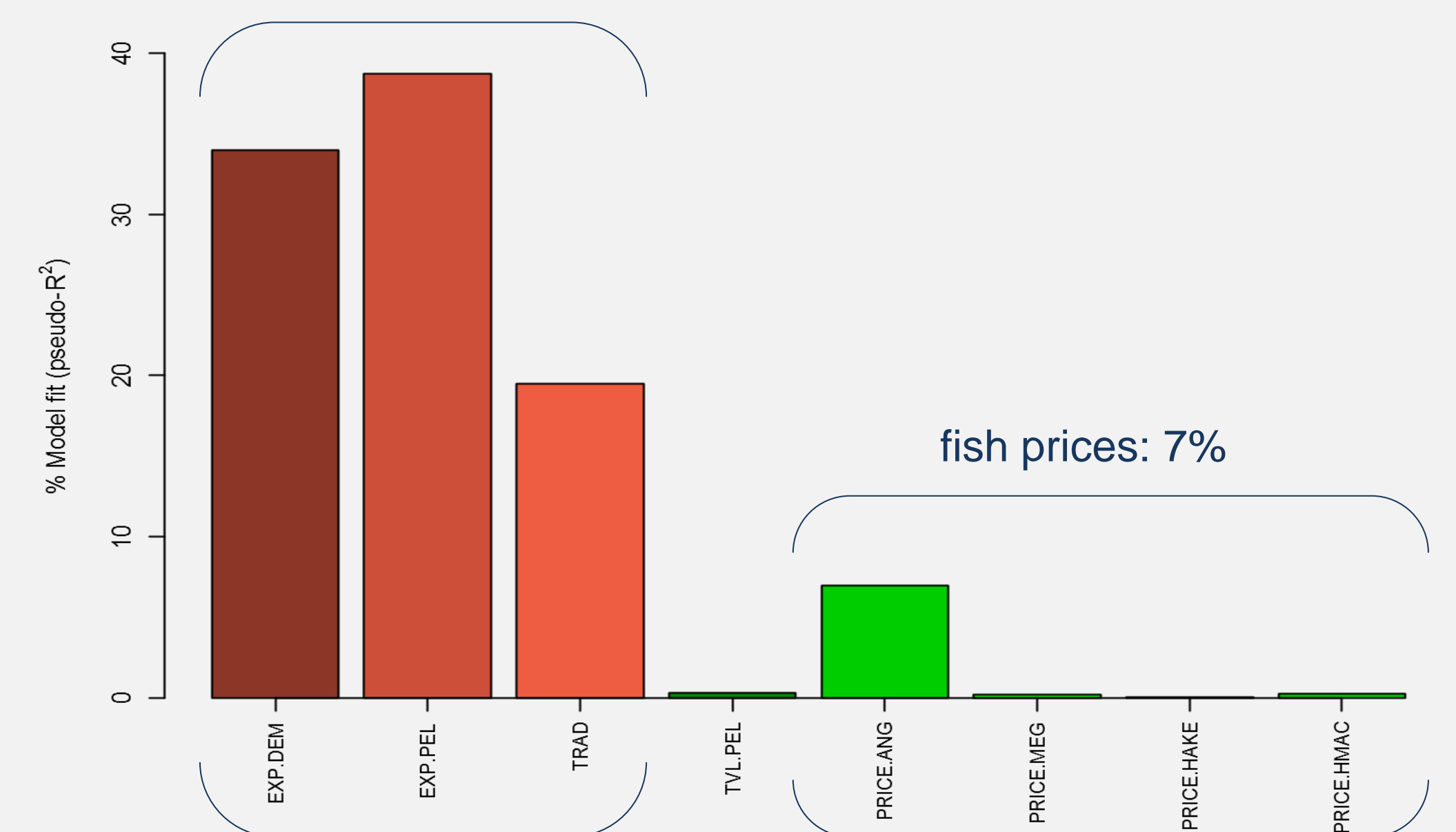|	VARIABLE	TYPE	MEANING	FREQ	Mean (sd)	Final model
	Y=METIER	categorical	Dependent variable			
			DEMERSAL (0)	0.45		
			PELAGIC (1)	0.55		
Vessel specific	EXP.PEL$_{w-1}$	numerical	number pelagic trips in w-1 by vessel			*
	EXP.DEM$_{w-1}$	numerical	number demersal trips in w-1 by vessel			*
	TRADITION	numerical	number accumulated trips for each métier by vessel			*
Fish prices whole fleet	PRICE.ANG$_{w-1}$	numerical	average price anglerfish (euros/kg) in w-1		6.1 (0.95)	*
	PRICE.MEG$_{w-1}$	numerical	average price megrims (euros/kg) in w-1		6.7 (0.88)	*
	PRICE.HAKE$_{w-1}$	numerical	average price hake (euros/kg) in w-1		2.6 (0.60)	*
	PRICE.HMAC$_{w-1}$	numerical	average price horse mackerel (euros/kg) in w-1		0.9 (0.26)	*
	PRICE.MAC$_{w-1}$	numerical	average price mackerel (euros/kg) in w-1		0.7 (0.28)	
Value and weight whole fleet	TVL.PEL$_{w-1}$	numerical	average value pelagic trips (euros) in w-1		4410 (1158)	*
	TVL.DEM$_{w-1}$	numerical	average value demersal trips (euros) in w-1		4221 (669)	
	LAND.DEM$_{w-1}$	numerical	average landing demersal trips (kg) in w-1		1975 (1120)	
	LAND.PEL$_{w-1}$	numerical	average landings pelagic trips (kg) in w-1		5236 (3276)	
Management measures	L. REST.HAKE.100k	categorical	restricted hake landings: 100 kg/week/vessel			
			No (0)	0.89		
			Yes (1)	0.11		
	Q.REST.BWHITING	categorical	reduced blue whiting quota			
			No (0)	0.51		
			Yes (1)	0.49		

w-1: previous week

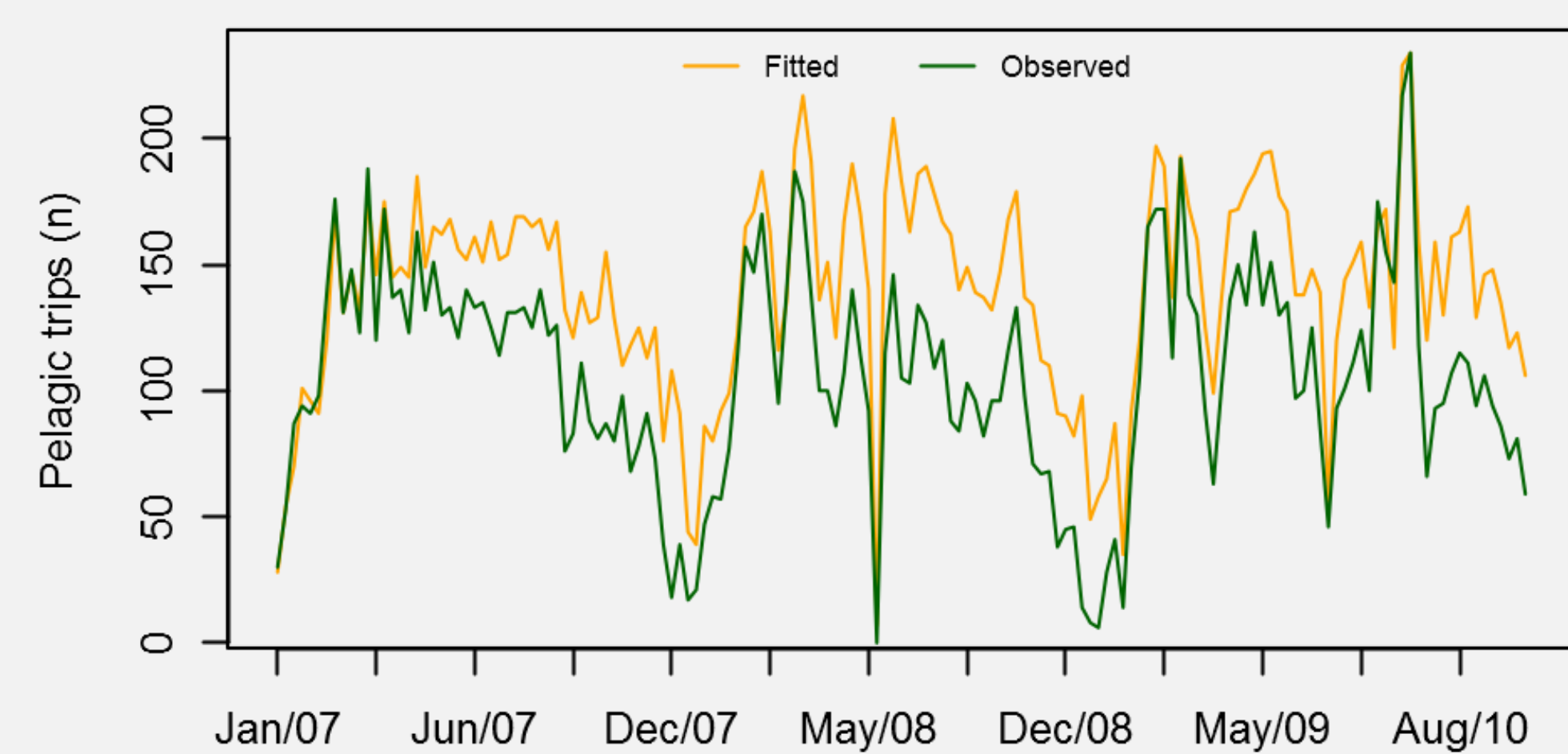final model: goodness fit: pseudo-R^2 = 0.28; *significant at 1%

Métier choice drivers

individual vessel factors: previous week experience & tradition: 92%

fish prices: 7%

- restricted hake and blue whiting quotas did not affect métier choice
- landings volume in previous week did not outperform the model

% Model fit (pseudo-R^2)

EXP DEM / EXP PEL / TRAD / TVL PEL / PRICE ANG / PRICE MEG / PRICE HAKE / PRICE HMAC

Model performance

Fitted — Observed

Pelagic trips (n)

Jan/07 Jun/07 Dec/07 May/08 Dec/08 May/09 Aug/10

- 70% correct predictions
- overestimation of pelagic metier

Conclusions

- fishers' previous week experience is the key issue in the métier choice[2,3]
- species price and seasonal availability are also drivers of the métier selection

Future work

- explore interactions between factors in the model
- analyse the effect of Individual Vessel Quota system

References

[1] Castro J. and Santurtún, M. 2012. Mixed-fisheries advice for ICES WGHMM stocks. WD6 presented at ICES WGHMM2012.

[2] Holland, D.S. and Sutinen, J.G. 1999. An empirical model of fleet dynamics in New England trawl fisheries. Canadian Journal of Fisheries and Aquatic Sciences 56: 253-264.

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[4] McFadden, D. 1974. Conditional logit analysis of qualitative choice behavior. In Frontiers in Econometrics, pp. 105-142. Ed. by P. Zarembka. Academic Press, New York.

[5] R Core Team. 2014. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.